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(54) PORTABLE POWER TOOL WITH A DEPTH ADJUSTMENT MECHANISM

HANDWERKZEUGMASCHINE MIT EINER TIEFENEINSTELLUNG

OUTIL ÉLECTRIQUE AVEC UN MÉCANISME D'AJUSTEMENT DE PROFONDEUR

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(56) References cited:
**WO-A1-81/00926 WO-A1-03/000473
US-A- 3 418 965 US-A- 4 319 860
US-A- 4 484 608 US-A1- 2002 164 223
US-A1- 2009 114 314 US-A1- 2010 206 431
US-B2- 7 497 649**

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Description

TECHNICAL FIELD

[0001] The disclosure relates to a portable power tool according to the preamble of claim 1. Such a portable power tool is known from the document WO03/000473A1.

BACKGROUND

[0002] Plunge base routers have long been used to make cutouts, grooves and to form edges on wood and other solid-surface workpieces. Such routers include a base and a housing having a motor which rotates a router bit for making the grooves and cuts into a workpiece. The housing is vertically movable relative to the base on two guide posts that are connected to the base.

[0003] Typically, a plunge base router can be used in an upright position in which the base is placed on top of a workpiece to be cut. In the upright position, the router is vertically movable relative to the base on the guide posts so that the router bit extends at a predefined distance below the lower surface of the base, exposing the router bit to the workpiece to be cut. The term "cutting depth" is used to describe the distance that the router bit extends below the base.

[0004] In order to select the cutting depth, plunge routers provide a depth adjustment mechanism. Some routers provide a coarse adjustment mechanism to generally find the depth,

and a fine adjustment mechanism to locate the depth more precisely than the coarse adjustment mechanism.

[0005] In one exemplary use case, a plunge router having both coarse and fine adjustment mechanisms is used in the upright position when installing a hinge to a wooden door. Prior to turning on the motor, the user adjusts the router bit to the correct cutting depth corresponding to the depth of the hinge installed on the door. First, the user adjusts the coarse adjustment mechanism to vertically position the router bit even with the lower surface of the base, with the router bit in contact with the door. The threaded fine adjustment mechanism is then turned so that the router bit may be plunged to a depth below the lower surface of a base at a cutting depth corresponding to the thickness of the hinge to be installed. The router is then turned on and plunged into the door to cut away the wood to install the hinge.

[0006] The screw thread of the fine adjustment mechanism is typically either a US-standard (empirical) sized thread or a metric system thread, usually depending on the country in which the router is to be sold. However, demand for either the standard or metric fine adjustment is becoming less dependent on geographical location, as router users are more commonly encountering situations in which either or both standard or metric measurements are needed. This presents a problem for a user of a plunge router having an adjustment mechanism relying

on one standard, when the user must make cuts based on the other standard.

[0007] Accordingly, a depth adjustment feature of a router that is not limited to either a US-standard or a metric system would be beneficial.

[0008] US 3418965 A discloses a motion read-out device for indicating the relative movement between two members of two sets of units.

[0009] WO 03/000473 A1 discloses an apparatus for setting a zero-reference point for a power tool which comprises an adjustable reference marker and a scale for comparison therewith.

SUMMARY

[0010] The following is a brief summary of subject matter described in greater detail herein. This summary is not intended to be limiting as to the scope of this disclosure or to the claims.

[0011] In order to facilitate making fine adjustments to a plunge depth of a portable power tool such as a router, a system includes a portable power tool, in particular a router, and a depth adjustment device configured to selectively make fine adjustments to the plunge depth according to one of a plurality of different measurement scales.

[0012] According to the invention, a portable power tool having the features of claim 1 is provided.

[0013] In one embodiment, the first measurement scale is US standard (empirical), and the second measurement scale is metric.

[0014] In an embodiment, the first cap defines a first plurality of notches configured to indicate an amount that the first cap has been rotated on the first threading. A first spacing between each of the first plurality of notches corresponds to predefined increment changes in the vertical distance according to the first measurement scale. The second cap defines a second plurality of notches configured to indicate an amount that the second cap has been rotated on the second threading. A second spacing between each of the second plurality of notches corresponds to predefined increment changes in the vertical distance according to the second measurement scale.

[0015] In another embodiment, the depth adjustment mechanism further includes a first elastic member and a second elastic member, and further defines a first annular cutout adjacent to the first threading and a second annular cutout adjacent to the second threading. The first elastic member is received in the first annular cutout and is configured to bias the first cap against motion, and the second elastic member is received in the second annular cutout and is configured to bias the second cap against motion.

[0016] In a further embodiment, the depth adjustment mechanism further includes an adjustment member, and the carriage defines a vertical passage aligned with the stop element and an opening transverse to and intersect-

ing with the passage. The passage is configured to slidably receive the main body of the depth adjustment mechanism, and the opening is configured to receive the adjustment member. The adjustment member is operable to extend through the opening into the passage in order to engage the main body received in the passage and mount the main body on the carriage.

[0017] In one embodiment, the carriage includes a receiver member mounted on the carriage, where the receiver member defines the vertical passage and the opening. In another embodiment, the receiver member is integral with the carriage.

[0018] In an embodiment, the system further includes a depth scale member configured to be slidably mounted on the main body. The depth scale has first markings corresponding to the first measurement scale and second marking corresponding to the second measurement scale.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 shows a perspective view of an exemplary embodiment of a router assembly with a depth adjustment mechanism according to this disclosure;

Fig. 2 shows a partial perspective view of the router assembly of FIG. 1 showing a detail view of the depth adjustment mechanism;

Fig. 3A shows a top partial perspective view of the router assembly of FIG. 1 showing a detail view of a depth rod receiver with a depth rod and a coarse adjustment knob removed;

Fig. 3B shows a bottom partial perspective view of the depth rod receiver of Fig. 3A;

Fig. 4 shows a perspective view of an exemplary embodiment of a coarse adjustment knob of a depth adjustment mechanism according to this disclosure;

Fig. 5 shows another perspective view of the router assembly of Fig. 1;

Fig. 6 shows a partial perspective view of the router assembly of Fig. 1, showing a detail view of a fine adjustment mechanism engaged with the stop element of the base plate;

Fig. 7 shows a perspective view of an exemplary embodiment of the dual adjustable depth rod for a depth adjustment mechanism according to the invention;

Fig. 8A shows a partial perspective view of the dual adjustable depth rod of FIG. 7 depicting one of the fine adjustment mechanisms with the cap removed;

Fig. 8B shows a partial perspective view of the dual adjustable depth rod of FIG. 7 depicting another one of the fine adjustment mechanisms with the cap removed;

Fig. 9 shows a partial perspective view of the router assembly of Fig. 1, showing a detail view of the fine adjustment mechanism being adjusted according to

the invention;

Fig. 10 shows an exploded perspective view of the router base and dual adjustable depth rod of Fig. 1.

5 DETAILED DESCRIPTION

[0020] Fig. 1 shows an embodiment of a router assembly 10. The router assembly 10 includes a router 12, and a plunge base 14.

10 **[0021]** The router 12 is secured to the plunge base 14, and includes a generally cylindrically-shaped housing 18 that includes a power switch 22, an accessory tool holder 24, and a router motor (not shown) housed in the housing 18. The housing 18 can be constructed of any acceptable rigid material such as plastic, metal, or composite materials such as fiber reinforced polymer. In one embodiment, the motor includes an electric motor configured to receive power from an electrical cord 20 via an AC outlet. In another embodiment, the electric motor is configured to receive power from a rechargeable battery (not shown) connected to the motor.

[0022] Power to the motor is controlled by the power switch 22. The motor includes a drive shaft (not shown) that is configured to be rotated by the motor about a motor axis (not shown). The drive shaft supports the accessory tool holder 24, which is configured to releasably secure various router bits (not shown) to the drive shaft for rotation by the motor. In the embodiment shown, the accessory tool holder 24 is a collet, but in other embodiments is a chuck, a clamp or any other acceptable accessory tool holder.

[0023] With continued reference to Fig. 1, the plunge base 14 of the router assembly 10 includes a carriage 16 slidably mounted to two guide posts 30, 32 that are supported by a base plate 27.

[0024] The base plate 27 includes a generally flat upper plate 28 configured to support the router 12 and carriage 16 in an upright position above a workpiece 1, and a lower plate or platform 29 secured to a lower surface of the upper plate member 28 configured to enable router assembly 10 to slide smoothly upon a workpiece during operation. In this embodiment, the lower plate 29 includes a plastic, but any acceptable smooth material can be used. The upper plate 28 defines two receiving openings 15A, 15B (Fig. 10) configured to secure the guide posts 30, 32 in an upright position. The base plate 27 further defines an opening 34 through which a router bit may be extended to engage a workpiece, the opening 34 defined by two corresponding openings of the upper plate 28 and the lower plate 29.

[0025] As best shown in Fig. 2, the opening of the lower plate 29 is smaller than the opening of the upper plate 28, enabling placement of a dust guard (not shown) on the upper surface of lower plate 29 within the opening of the upper plate 28.

[0026] The base plate 27 further includes a stop member or stop element 38 secured to an upper surface of the upper plate 28, described in more detail below. As

shown in the exploded view in Fig. 10, the lower plate 29 is secured to the upper plate 28 by threaded fasteners 90A, 90B, 90C. In other embodiments, the lower plate 28 is secured to the upper plate 28 by adhesive, snap-fit, or any other acceptable method. In yet other embodiments, the lower plate 29 is in one piece with the upper plate 28 to together define a platform for supporting the router assembly 10 on the workpiece.

[0027] Returning to Fig. 1, the carriage 16 includes a collar portion 44, handles 40, 42, a mounting portion 46, and a depth adjustment mechanism 52. The collar portion 44 is configured to releasably retain the router 12 upright, oriented perpendicularly with respect to the base plate 27 and aligned with the opening 34 defined in the base plate 27.

[0028] In the embodiment of Fig. 1, the collar portion 44 defines an open-ended passage through which the body of the router 12 extends. In other embodiments, the collar portion 44 of the carriage 16 may have a variety of different configurations for releasably retaining the router. In one embodiment, the collar portion 44 includes a fastening system, such as a clamping mechanism (not shown), for securing the router 12 to the carriage 16. Any acceptable fastening system may be used to secure the router 12 to the carriage 16. In another embodiment, the router is substantially permanently affixed to the carriage 16.

[0029] The handles 40, 42 are secured on opposite sides of the collar 16 with threaded fastening elements 92A, 92B (FIG. 10) and are configured to be grasped by a user to move the router assembly 10 about a workpiece during a cutting operation, and, as described in detail below, to plunge the carriage 16 with the router 12. Although the embodiment shown has two handles, one handle or any acceptable number of handles may be positioned on the carriage 16, or on another portion of the router assembly 10 so that the user may grip and hold the router assembly 10 during operation.

[0030] The mounting portion 46 of the carriage 16 includes a first receiver 17 defining a passage 31 (FIG. 10) and a second receiver 19 defining a passage 33 (FIG. 10). Each passage 31, 33 is sized and positioned to slidably receive one of the guide posts 30, 32. The passages 31, 33 may include bushings that facilitate the movement of the carriage 16 with respect to the guide posts 30, 32. Each guide post 30, 32 is secured at one end to the base plate 27. The guide posts 30, 32 cooperate with the passages 31, 33 to enable the carriage 16 to be moved, or "plunged", in an axial direction toward the base plate 27 (alternately referred to as a lowering, or downward, direction), and an axial direction away from the base plate 27 (alternately referred to as a raising, or upward, direction).

[0031] As shown in FIG. 10, the guide posts 30, 32 of the carriage 16 each include a biasing mechanism 21A, 21B, such as a pair coil springs each positioned within a bushing 25A, 25B inside the guide posts 30, 32. The ends of each support element 23A, 23B each extend from a

respective guide post 30, 32 and cooperate with a respective end cap 47A, 47B of the mounting portion 46 to bias the carriage 16 to the first position away from the base plate 27.

[0032] Returning to FIG. 2, the mounting portion 46 further includes a plunge lock mechanism 48 for releasably locking the carriage 16 to the guide posts 30, 32 at substantially any position between the first position and the second position. With reference to FIG. 10, the plunge lock mechanism 48 comprises a plunge lock lever 50 operatively coupled to a fastening mechanism 49, shown as a bolt in the embodiment of FIG. 10, with a fastener 53. The fastening mechanism 49 includes threads that cooperate with internal threads in an opening (not shown) of the mounting portion 46. The plunge lock lever 50 is pivotable between a locked and an unlocked position. When the plunge lock lever 50 is pivoted, the threads of the fastening mechanism 49 cooperate with corresponding threads within the opening of the mounting portion 46 to axially move the fastening mechanism 49 into or out of engagement with the guide post 30. The plunge lock lever 50 is biased to a locked position with a biasing element 51 in which the fastening mechanism 49 is positioned in engagement with the guide post 30 thereby preventing movement of the carriage with respect to the guide posts 30, 32. The lever 50 can be actuated to an unlocked position in which the fastening mechanism 49 is rotated out of engagement with the guide post 30 so as to allow movement of the carriage 16 with respect to the guide posts. In the embodiment shown in Fig. 10, the biasing element 51 is a torsion spring. In other embodiments, the biasing element 51 is a helical spring, an elastic member, or any other acceptable biasing member. In another embodiment, the fastening mechanism 49 is biased due to gravity, such as via a weighted portion thereof. Moreover, while in the embodiment shown in Fig. 10, the fastening mechanism 49 engages guide post 30, in other embodiments the fastening mechanism 49 is configured to engage the guide post 32, or both guide posts 30, 32.

[0033] As best shown in FIG. 2, the mounting portion 46 further includes a depth scale 35. In the embodiment shown, the depth scale 35 includes indicia comprising two scales, including one scale in metric units (mm), and another scale in US units (inches). As described in detail below, the depth scale 35 enables the user to coarsely adjust the plunge depth.

[0034] With reference to FIGS. 1 and 2, the depth adjustment mechanism 52 includes a depth rod receiver 54 mounted to or in one piece with the carriage 16 and defining a passage 56 (shown in FIGS. 3A-3B) configured to receive a plastic bushing 57 (FIGS. 3A-3B and 10). The plastic bushing 57 includes a circular upper retaining element 59 (FIG. 3A) configured to abut the upper surface of the rod receiver 54, and lower retaining elements 61 (FIG. 3B) configured to abut the lower surface of the rod receiver 54. The upper and lower retaining elements 59, 61 hold the bushing 57 in place within the depth rod pas-

sage 56. The bushing 57 is configured to slidably receive a dual adjustable depth rod 58. A coarse adjustment element 60 (Fig. 2) is configured to selectably secure the depth rod 58 within the depth rod passage 56, as described in more detail below.

[0035] As best shown in FIG. 7, the dual adjustable depth rod 58 is a rod member having flattened sides (shown partially in FIGS. 8A-8B), and includes a first fine adjustment mechanism 70 at a first end (101), and a second fine adjustment mechanism 80 at a second end (102). The depth rod 58 is reversible in that it is configured to be placed within the depth rod passage 56 with either the first fine adjustment mechanism 70 at the bottom and the second fine adjustment mechanism 80 at the top (as shown in FIG. 1), or with the second fine adjustment mechanism 80 at the bottom and the first fine adjustment mechanism 70 at the top (as shown in FIG. 5). As shown in FIG. 2, a depth marker 37 is slidably secured to the depth rod 58, and includes indicia enabling the depth marker 37 to be aligned with indicia on the depth scale 35 of the carriage 16 so that the plunge depth may be selected, as described in further detail below.

[0036] As mentioned above, the carriage 16 is configured to be plunged axially toward and away from the base plate 27. More specifically, the carriage 16 is configured to be plunged between a first, or home, position, that is distally located with respect to the base plate 27, as shown in FIG. 1, and a second, or plunged, position, in which an outer surface of one of the fine adjustment mechanisms 70, 80, depending on the orientation of the depth rod 58, contacts an upper surface of the stop element 38, thereby preventing further downward movement of the carriage 16, as best shown in FIG. 6. When the router 12 is secured to the carriage 16 with the carriage in the first position, a router bit (not shown) mounted to the router 12 with the accessory tool holder 24 is spaced apart from the base plate 27. When the carriage 16 is plunged to the second position, the router bit (not shown) can be extended through the opening 34 in the base plate 27 to perform work on the workpiece.

[0037] The plunge depth is the lower limit of the path of movement of the carriage 16, i.e., the position of the carriage 16 in the second position with one of the fine adjustment mechanisms 70, 80 in contact with the upper surface of the stop element 38. The plunge depth of the plunge router assembly 10 is adjustable in both a coarse and a fine manner with the depth adjustment mechanism 52.

[0038] Coarse adjustments of the plunge depth are made by adjusting the vertical position of the depth rod 58 of the depth adjustment mechanism 52 with respect to the depth rod receiver 54 with the aid of the coarse adjustment element 60. Turning to FIG. 4, the coarse adjustment element 60 includes a knob 62, and a threaded pin 64 configured to cooperate with internal threads of an opening 66 (FIG. 3A) defined in the depth rod receiver 54 from an outer surface of the depth rod receiver

54 inwardly to the depth rod passage 56. Returning to FIG. 1, with the depth adjustment rod 54 inserted into the depth rod passage 56, and the threaded pin 64 (FIG. 4) of the coarse adjustment element 60 within the opening 66 (FIG. 3A) of the depth rod receiver 54, the knob 62 can be rotated in a tightening direction until an end of the threaded pin 64 contacts the bushing 57 (Fig. 3A) to apply pressure to the depth rod 58 to frictionally hold the depth rod 58 in place. The knob 62 can also be rotated in an opposite, loosening direction so that the pin 64 is out of contact with the depth rod 58, allowing the depth rod 58 to be freely moved axially upward and downward within depth rod passage 56, and even removed completely from the depth rod passage 56.

[0039] Although one particular embodiment of a coarse adjustment mechanism has been described, the coarse adjustment mechanism can be a clamp, locking mechanism or any other acceptable mechanism that provides for coarse positional adjustment of the depth rod. Moreover, while in the embodiment shown the pin 64 contacts the bushing 57 to tighten the depth rod 58, the bushing may further define an opening through which the pin 64 extends so that the pin 64 directly contacts the depth rod 58. In yet a further embodiment, no bushing is provided.

[0040] Fine adjustments of the plunge depth are made by adjusting the fine adjustment mechanism 70 or fine adjustment mechanism 80, described with respect to FIGS. 7-9. Referring specifically to FIG. 7, the depth rod 58 is shown with the fine adjustment mechanisms 70, 80 at each end.

[0041] Turning to FIG. 8A, the end of the depth rod 58 with fine adjustment mechanism 70 is shown. According to the invention, the fine adjustment mechanism 70 includes a cap 72 having internal threads (not shown) that cooperate with corresponding external threads of a first threaded end 74 of the depth rod 58. In FIG. 8A, the cap has been removed from the threaded end 74 of the depth rod 58 by rotating the cap 72 with respect to the depth rod 58 in a loosening direction. An elastic ring 76 is positioned in a cutout of the depth rod 58 adjacent the threaded end 74, and is configured to hold the cap 72 in place and prevent rotation of the cap 72 due to vibrations and other sudden movements of the router assembly 10 when the user is not selectively rotating the cap 72. In order to finely adjust the plunge depth with the depth adjustment mechanism 70, the cap 72 is rotated (see FIG. 9) to adjust the axial position of the cap 72 with respect to the ends of the depth rod 58. The cap 72 further includes a notch 78 that represents a visual indicator of the amount that the cap 72 has been rotated, to precisely control any fine adjustments made.

[0042] Turning to FIG. 8B, the end of the depth rod 58 with fine adjustment mechanism 80 is shown. The fine adjustment mechanism 80 in the embodiment shown includes according to the invention, a cap 82 having internal threads (not shown) that correspond to external threads of the first threaded end 84. In FIG. 8B, the cap

has been removed from the threaded end 84 by rotating the cap 82 with respect to the depth rod 58 in a loosening direction. An elastic ring 86 is positioned in a cutout of the depth rod 58 adjacent the threaded end 84, and is configured to hold the cap 82 in place and prevent rotation of the cap 82 due to vibrations and other sudden movements of the router assembly 10 when the user is not selectively rotating the cap 82. In order to finely adjust the plunge depth with the depth adjustment mechanism 80, the cap 82 is rotated (see FIG. 9) to adjust the axial position of the cap 82 with respect to the end of the depth rod 58. The cap 82 further includes a notch 88 substantially similar to the notch 78 of cap 72.

[0043] The threads of the cap 72 and the corresponding threads of the first threaded end 74 are preferably different than the threads of the cap 82 and the threads of the corresponding threaded end 84. In one embodiment, the cap 72 and the first threaded end 74 are pitched so as to have US standard (empirical) sized threads, while the cap 82 and the second threaded end 84 are pitched so as to have metric sized threads. Such an arrangement allows for a single router and a single adjustment rod to be used to accommodate applications where either or both of US standard (empirical) units and metric units are required.

[0044] Furthermore, the fine adjustment mechanisms 70, 80 in embodiments have alternative or additional features. In one embodiment, the threads are sized so that the depth of cut can be selected in small increments. For example, in one embodiment, one complete revolution corresponds to a specific dimension. Each cap 72, 82 may further include indicia, markings, or any desired number of notches 78, 88 located incrementally about the circumference indicating the amount that the element has been turned. For example, in one embodiment, an indicia, marking or notch is located at every quarter of the circumference so that the user can precisely turn the element an amount corresponding to a desired depth change. Rotation of the cap by an amount corresponding to each notch results in a depth change of a preselected distance. In other embodiments, any other fraction of the circumference is selected to have indicia, markings or notches corresponding to a desired depth change. For example, the caps 72, 82 may include two, three, four, eight, or any other desired number of markings, indicia or notches 78, 88 to provide a visual indicator of how much the cap has been rotated to adjust the plunge depth.

[0045] Operation of coarse and fine adjustment is now discussed with reference to FIG. 1 in which coarse adjustment precedes fine adjustment. The user must ensure that the depth rod 58 is oriented in the direction in which the fine adjustment mechanism 70, 80 having the desired type of threads is positioned at the bottom. For example, the orientation of FIG. 1 is selected with fine adjustment mechanisms 70 on the bottom when US standard (empirical) fine adjustment is desired, while the orientation of FIG. 5 is selected with the fine adjustment

mechanism 80 on the bottom when metric fine adjustment is desired. If the incorrect fine adjustment mechanism 70, 80 is positioned at the bottom, the knob 62 is untightened, and the depth rod 58 is fully removed from the depth rod passage 56, correctly oriented, and placed back within the depth rod passage 56. The knob 62 is retightened to ensure the depth rod is secured in the depth rod passage 56.

[0046] With the router assembly 10 placed on a surface 36 of the workpiece 1 to be cut with the lower surface of the base plate 27 in contact with the surface 36 of the workpiece 1 and the carriage 16 in the first position, coarse depth adjustment commences. Both handles 40, 42 are securely grasped, and the plunge lock mechanism 48 is actuated by pressing the plunge lock lever 50 so that the plunge lock mechanism 48 is in the unlocked position, allowing the carriage 16 to be freely moved vertically with respect to the base plate 27. The carriage 16 is plunged until the router bit (not shown) just comes into contact with the surface 36 of the workpiece 1, and the plunge lock lever 50 is released to the locked position to vertically secure the carriage 16 with respect to the base plate 27. With the router bit in contact with the surface 36 of the workpiece 1, the knob 62 is untightened, and the depth rod 58 is moved vertically so that the outer surface of the selected fine adjustment mechanism 70, 80 contacts the upper surface of the stop element 38. The knob 62 is retightened to ensure that the depth rod 58 is secured tightly in place. If the selected fine adjustment mechanism 70, 80 contacts the upper surface of the stop element 38 prior to reaching a point in which the router bit just contacts the surface 36 of the workpiece 1, the knob 62 must first be untightened to allow for the depth rod 58 to move vertically within the rod passage 56 prior to proceeding to plunge the carriage 16 to a depth in which the router bit may contact the surface 36 of the workpiece 1.

[0047] Next, the lever 50 is again actuated, the carriage 16 is returned to the first position, and the plunge lock mechanism 48 again locked. The cap 72, 82 of the selected fine adjustment mechanism 70, 80 is then rotated until the cap is axially moved a distance corresponding to the desired cutting depth, as discussed above. Rotating the cap 72, 82 of the selected fine adjustment mechanism 70, 80 should result in axial displacement of the cap 72, 82 in an upward direction with respect to the respective threaded end 74, 84, thereby allowing the router bit to be plunged into the workpiece to be cut.

[0048] In other words, the coarse adjustment via the coarse adjustment mechanism 60 positions the depth rod 50 such that the selected fine adjustment mechanism 70, 80, engages the stop element 38 precisely as the router bit would engage the workpiece. The engagement between the fine adjustment element 70, 80 and the stop element 38 thus delimits a plunge of the router 10 so that the router bit, when plunged is at a nominal position, i.e., at the surface of the workpiece. The fine adjustment is used to modify position of the end of the fine adjustment

mechanism, which enables the router 10 to plunge an additional distance before the fine adjustment mechanism again engages the stop element 38. This additional distance, selected by adjusting the fine adjustment mechanism 70, 80 corresponds to the selected cutting depth / plunge depth.

[0049] The power switch 22 can subsequently be actuated to start the motor to cause the router bit to rotate, and the carriage 16 can be plunged to the selected cutting depth by actuating lever 50 and plunging the carriage 16 so that the router bit extends through the opening 34 of the base plate 27 into the workpiece 1 until the selected cutting depth is reached, whereby the selected fine adjustment mechanism 70, 80, as adjusted, engages with the stop member 38.

[0050] The desired plunge depth may also be selected with the assistance of the depth marker 37 and the depth scale 35, particularly for course adjustments when fine adjustments are not desired. First, the plunge depth is zeroed by ensuring that the router bit is in contact with the surface 36 of the workpiece 1 when plunged to the second position, with the selected fine adjustment mechanism 70, 80 in contact with the surface 36 of the workpiece 1. The carriage 16 is returned to the first position, and the position of the indicia of the depth marker 37 with respect to the indicia of the depth scale is noted. The course adjustment element 60 may then be untightened and the depth rod 58 moved vertically upwards until the indicia of the depth marker 37 is aligned at a second position with indicia on the depth scale 35 corresponding to a desired plunge depth. The change in position of the indicia of the depth marker 37 with respect to the indicia of the depth scale 35 represents the depth that the router bit will travel into the workpiece. The course adjustment element 60 can be retightened to secure the depth rod 58, and a routing operation may commence. In another embodiment, the fine adjustment mechanism 70, 80 can be adjusted after adjusting the course adjustment element 60 as described above.

Claims

1. A portable power tool, comprising:

a base (14) defining a platform (29) for supporting the power tool on a workpiece, a stop element (38), and a support structure;
a carriage (16) slidably mounted on the support structure so as to be vertically movable relative to the platform (29), and configured to support the portable power tool; and
a depth adjustment mechanism (52) mounted on the carriage (16) and configured to engage the stop element (38) as the carriage (16) slides toward the platform (29) to define a plunge depth of the power tool, the depth adjustment mechanism (52) being selectably mountable in (i) a first

position, whereat the depth adjustment mechanism (52) is operable to adjust the plunge depth according to a first measurement scale, and (ii) a second position, whereat the depth adjustment mechanism (52) is operable to adjust the plunge depth according to a second measurement scale different from the first measurement scale, wherein one of the first measurement scale and second measurement scale is selectable due to a selected mounting of the depth adjustment mechanism (52) on the carriage (16), wherein the depth adjustment mechanism (52) includes:

a main body (100) defining a first end (101) and a second end (102); and
a first and second cap (72, 82) mounted on the first end (101) and second end (102), respectively, each cap (72, 82) movable relative to the main body (100) and defining a respective stop surface;
wherein the depth adjustment mechanism (52), due to its selective mountability in one of the first position and second position, is adapted to orient a corresponding one of the first and second cap (72, 82) toward the stop element (38) to engage the respective stop surface with the stop element (38) at the plunge depth, the plunge depth defined by a vertical distance between the stop surface and the stop element (38); and
wherein by moving the one of the first and second cap (72, 82) relative to the main body (100) the vertical distance to thereby adjust the plunge depth is modifiable, **characterized in that** the first end (101) of the main body (100) has a first threading with a first pitch, the first cap (72) configured to be threaded onto the first threading such that for a unit rotation of the first cap (72) on the first threading, the vertical distance is adjusted by a unit increment according to the first measurement scale; and
the second end (102) of the main body (100) has a second threading with a second pitch different than the first pitch, the second cap (82) is configured to be threaded onto the second threading such that for a unit rotation of the second cap (82) on the second threading, the vertical distance is adjusted by a unit increment according to the second measurement scale.

2. The power tool of claim 1, wherein:

the first cap (72) defines a first plurality of indicators configured to indicate a predefined rotation of the first cap (72) on the first threading, a

first spacing between each of the first plurality of notches corresponding to a predefined increment change in the vertical distance according to the first measurement scale; and the second cap (82) defines a second plurality of indicators configured to indicate a predefined rotation of the second cap (82) on the second threading, a second spacing between each of the second plurality of notches corresponding to a predefined increment change in the vertical distance according to the second measurement scale.

3. The power tool of claim 1, further comprising:

a first elastic member and a second elastic member;
wherein the main body (100) further defines:

a first annular cutout adjacent to the first threading, the first elastic member received in the first annular cutout and configured to resist at least one of rotation and vibration of the first cap (72); and

a second annular cutout adjacent to the second threading, the second elastic member received in the second annular cutout and configured to resist at least one of rotation and vibration of the second cap (82).

4. The power tool of claim 1, further composing:

an adjustment member;
the carriage (16) defining a vertical passage aligned with the stop element (38) and configured to slidably receive the main body (100) of the depth adjustment mechanism (52), and an opening transverse to and intersecting with the passage and configured to receive the adjustment member; and
the adjustment member being operable to extend through the opening into the passage in order to engage the main body (100) received in the passage and mount the main body (100) on the carriage (16).

5. The power tool of claim 4, wherein the carriage (16) includes a receiver member mounted thereto, the receiver member defining the vertical passage and the opening.

6. The power tool of claim 1, further comprising:
a depth scale member configured to be slidably mounted on the main body (100), the depth scale having first markings corresponding to the first measurement scale and second marking corresponding to the second measurement scale.

7. The power tool of claim 1, wherein the portable power tool is a router (12).

5 Patentansprüche

1. Tragbares Elektrowerkzeug, umfassend:

eine Basis (14), die eine Fläche (29) zum Tragen des Elektrowerkzeugs auf einem Werkstück, ein Anschlagelement (38) und eine Tragstruktur definiert,
einen Wagen (16), der auf gleitende Weise auf der Tragstruktur befestigt ist, um relativ zu der Fläche (29) vertikal bewegbar zu sein, und dazu ausgelegt ist, das tragbare Elektrowerkzeug zu tragen, und
einen Tiefeneinstellmechanismus (52), der auf dem Wagen (16) befestigt und dazu ausgelegt ist, mit dem Anschlagelement (38) einzugreifen, während der Wagen (16) zu der Fläche (29) gleitet, um eine Eintauchtiefe des Elektrowerkzeugs zu definieren, wobei der Tiefeneinstellmechanismus (52) in (i) einer ersten Stellung, in der der Tiefeneinstellmechanismus (52) in der Lage ist, die Eintauchtiefe nach einer ersten Messskala einzustellen, und (ii) einer zweiten Stellung, in der der Tiefeneinstellmechanismus (52) in der Lage ist, die Eintauchtiefe nach einer zweiten Messskala, die sich von der ersten Messskala unterscheidet, einzustellen, auf wählbare Weise befestigbar ist, wobei die erste Messskala oder die zweite Messskala auf Grund einer gewählten Befestigung des Tiefeneinstellmechanismus (52) auf dem Wagen (16) wählbar ist, wobei der Tiefeneinstellmechanismus (52) Folgendes umfasst:

einen Hauptkörper (100), der ein erstes Ende (101) und ein zweites Ende (102) definiert, und
einen ersten und einen zweiten Verschluss (72, 82), die an dem ersten Ende (101) beziehungsweise dem zweiten Ende (102) befestigt sind, wobei jeder Verschluss (72, 82) relativ zu dem Hauptkörper (100) bewegbar ist und eine entsprechende Anschlagfläche definiert,
wobei der Tiefeneinstellmechanismus (52) auf Grund seiner wählbaren Befestigbarkeit in der ersten Stellung oder der zweiten Stellung geeignet ist, einen entsprechenden des ersten oder des zweiten Verschlusses (72, 82) zu dem Anschlagelement (38) hin auszurichten, um die entsprechende Anschlagfläche mit dem Anschlagelement (38) in der Eintauchtiefe in Eingriff zu bringen, wobei die Eintauchtiefe durch einen

vertikalen Abstand zwischen der Anschlagfläche und dem Anschlagelement (38) definiert ist, und

wobei durch Bewegen des ersten oder des zweiten Verschlusses (72, 82) relativ zu dem Hauptkörper (100) der vertikale Abstand veränderbar ist, um dadurch die Eintauchtiefe einzustellen,

dadurch gekennzeichnet, dass das erste Ende (101) des Hauptkörpers (100) ein erstes Gewinde mit einer ersten Steigung aufweist, wobei der erste Verschluss (72) dazu ausgelegt ist, auf eine solche Weise auf das erste Gewinde geschraubt zu werden, dass für eine Einheitendrehung des ersten Verschlusses (72) auf dem ersten Gewinde der vertikale Abstand durch ein Einheiteninkrement nach der ersten Messskala eingestellt wird, und

das zweite Ende (102) des Hauptkörpers (100) ein zweites Gewinde mit einer zweiten Steigung aufweist, die sich von der ersten Steigung unterscheidet, wobei der zweite Verschluss (82) dazu ausgelegt ist, auf eine solche Weise auf das zweite Gewinde geschraubt zu werden, dass für eine Einheitendrehung des zweiten Verschlusses (82) auf dem zweiten Gewinde der vertikale Abstand durch ein Einheiteninkrement nach der zweiten Messskala eingestellt wird.

2. Elektrowerkzeug nach Anspruch 1, wobei:

der erste Verschluss (72) eine erste Vielzahl von Anzeigen definiert, die dazu ausgelegt sind, eine vorgegebene Drehung des ersten Verschlusses (72) auf dem ersten Gewinde anzuzeigen, wobei ein erster Zwischenraum zwischen jeder aus der ersten Vielzahl von Kerben einer vorgegebenen Inkrementänderung des vertikalen Abstands nach der ersten Messskala entspricht, und

der zweite Verschluss (82) eine zweite Vielzahl von Anzeigen definiert, die dazu ausgelegt sind, eine vorgegebene Drehung des zweiten Verschlusses (82) auf dem zweiten Gewinde anzuzeigen, wobei ein zweiter Zwischenraum zwischen jeder aus der zweiten Vielzahl von Kerben einer vorgegebenen Inkrementänderung des vertikalen Abstands nach der zweiten Messskala entspricht.

3. Elektrowerkzeug nach Anspruch 1, ferner umfassend:

ein erstes elastisches Element und ein zweites elastisches Element,
wobei der Hauptkörper (100) ferner Folgendes

definiert:

eine an das erste Gewinde angrenzende erste ringförmige Aussparung, wobei das erste elastische Element in der ersten ringförmigen Aussparung aufgenommen und dazu ausgelegt ist, einer Drehung und/oder einer Schwingung des ersten Verschlusses (72) zu widerstehen, und

eine an das zweite Gewinde angrenzende zweite ringförmige Aussparung, wobei das zweite elastische Element in der zweiten ringförmigen Aussparung aufgenommen und dazu ausgelegt ist, einer Drehung und/oder einer Schwingung des zweiten Verschlusses (82) zu widerstehen.

4. Elektrowerkzeug nach Anspruch 1, ferner umfassend:

ein Einstellelement,
wobei der Wagen (16) einen vertikalen Durchgang, der in einer Linie mit dem Anschlagelement (38) ausgerichtet und dazu ausgelegt ist, den Hauptkörper (100) des Tiefeneinstellmechanismus (52) auf gleitende Weise aufzunehmen, und eine Öffnung, die quer zu dem Durchgang verläuft und sich mit demselben kreuzt und dazu ausgelegt ist, das Einstellelement aufzunehmen, definiert, und
wobei das Einstellelement in der Lage ist, sich durch die Öffnung in den Durchgang zu erstrecken, um mit dem in dem Durchgang aufgenommenen Hauptkörper (100) einzugreifen und den Hauptkörper (100) auf dem Wagen (16) zu befestigen.

5. Elektrowerkzeug nach Anspruch 4, wobei der Wagen (16) ein an demselben befestigtes Aufnahmeelement umfasst, wobei das Aufnahmeelement den vertikalen Durchgang und die Öffnung definiert.

6. Elektrowerkzeug nach Anspruch 1, ferner umfassend:

ein Tiefenskalenelement, das dazu ausgelegt ist, auf gleitende Weise an dem Hauptkörper (100) befestigt zu sein, wobei die Tiefenskala erste Markierungen, die der ersten Messskala entsprechen, und zweite Markierungen, die der zweiten Messskala entsprechen, aufweist.

7. Elektrowerkzeug nach Anspruch 1, wobei es sich bei dem tragbaren Elektrowerkzeug um eine Fräsvorrichtung (12) handelt.

Revendications

1. Outil motorisé portatif, comprenant :

une base (14) définissant une plate-forme (29) 5
pour supporter l'outil motorisé sur une pièce à
travailler, un élément de butée (38), et une struc-
ture de support ;
un chariot (16) monté de façon coulissante sur 10
la structure de support afin d'être verticalement
mobile relativement à la plate-forme (29), et con-
figuré pour supporter l'outil motorisé portatif ; et
un mécanisme d'ajustement de profondeur (52)
monté sur le chariot (16) et configuré pour entrer 15
en prise avec l'élément de butée (38) lorsque le
chariot (16) coulisse vers la plate-forme (29)
pour définir une profondeur en plongée de l'outil
motorisé, le mécanisme d'ajustement de profon- 20
deur (52) étant montable de façon sélectionna-
ble dans (i) une première position, à laquelle le
mécanisme d'ajustement de profondeur (52) est
utilisable pour ajuster la profondeur en plongée
selon une première échelle de mesure, et (ii) 25
une seconde position, à laquelle le mécanisme
d'ajustement de profondeur (52) est utilisable
pour ajuster la profondeur en plongée selon une
seconde échelle de mesure différente de la pre- 30
mière échelle de mesure, dans lequel une de la
première échelle de mesure et de la seconde
échelle de mesure est sélectionnable en raison
d'un montage sélectionné du mécanisme
d'ajustement de profondeur (52) sur le chariot 35
(16), dans lequel le mécanisme d'ajustement de
profondeur (52) inclut :

un corps principal (100) définissant une pre- 40
mière extrémité (101) et une seconde ex-
trémité (102) ; et
une première et une seconde coiffe (72, 82)
montées sur les première extrémité (101) 45
et seconde extrémité (102), respective-
ment, chaque coiffe (72, 82) étant mobile
relativement au corps principal (100) et dé-
finissant une surface de butée respective ;
dans lequel le mécanisme d'ajustement de 50
profondeur (52), en raison de sa capacité
de montage sélective dans une de la pre-
mière position et de la seconde position, est
adapté pour orienter une correspondante
des première et seconde coiffes (72, 82) 55
vers l'élément de butée (38) pour mettre en
prise la surface de butée respective avec
l'élément de butée (38) à la profondeur en
plongée, la profondeur en plongée étant dé-
finie par une distance verticale entre la sur-
face de butée et l'élément de butée (38) ; et
dans lequel, en déplaçant l'une de la pre-
mière et de la seconde coiffe (72, 82) rela-

tivement au corps principal (100), la distan-
ce verticale pour ainsi ajuster la profondeur
en plongée est modifiable,

caractérisé en ce que la première extré-
mité (101) du corps principal (100) a un pre-
mier filetage avec un premier pas, la pre-
mière coiffe (72) étant configurée pour être
vissée sur le premier filetage de telle sorte
que, pour une rotation unitaire de la premiè-
re coiffe (72) sur le premier filetage, la dis-
tance verticale soit ajustée par un incrément
unitaire selon la première échelle de
mesure ; et

la seconde extrémité (102) du corps princi-
pal (100) a un second filetage avec un se-
cond pas différent du premier pas, la secon-
de coiffe (82) est configurée pour être vis-
sée sur le second filetage de telle sorte que,
pour une rotation unitaire de la seconde
coiffe (82) sur le second filetage, la distance
verticale soit ajustée par un incrément uni-
taire selon la seconde échelle de mesure.

2. Outil motorisé selon la revendication 1, dans lequel :

la première coiffe (72) définit une première plu-
ralité d'indicateurs configurés pour indiquer une
rotation prédéfinie de la première coiffe (72) sur
le premier filetage, un premier espacement en-
tre chacune de la première pluralité d'encoches
correspondant à un changement d'incrément
prédéfini de la distance verticale selon la pre-
mière échelle de mesure ; et

la seconde coiffe (82) définit une seconde plu-
ralité d'indicateurs configurés pour indiquer une
rotation prédéfinie de la seconde coiffe (82) sur
le second filetage, un second espacement en-
tre chacune de la seconde pluralité d'encoches cor-
respondant à un changement d'incrément pré-
défini de la distance verticale selon la seconde
échelle de mesure.

3. Outil motorisé selon la revendication 1, comprenant en outre :

un premier élément élastique et un second élé-
ment élastique ;
dans lequel le corps principal (100) définit en
outre :

une première découpe annulaire adjacente
au premier filetage, le premier élément élas-
tique étant reçu dans la première découpe
annulaire et configuré pour résister à au
moins une de la rotation et de la vibration
de la première coiffe (72) ; et
une seconde découpe annulaire adjacente
au second filetage, le second élément élas-

tique étant reçu dans la seconde découpe annulaire et configuré pour résister à au moins une de la rotation et de la vibration de la seconde coiffe (82).

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4. Outil motorisé selon la revendication 1, comprenant en outre :

un élément d'ajustement ;

le chariot (16) définissant un passage vertical aligné avec l'élément de butée (38) et configuré pour recevoir de façon coulissante le corps principal (100) du mécanisme d'ajustement de profondeur (52), et une ouverture transversale au passage, et intersectant ce dernier, et configurée pour recevoir l'élément d'ajustement ; et l'élément d'ajustement étant utilisable pour s'étendre à travers l'ouverture dans le passage afin d'entrer en prise avec le corps principal (100) reçu dans le passage et de monter le corps principal (100) sur le chariot (16).

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5. Outil motorisé selon la revendication 4, dans lequel le chariot (16) inclut un élément récepteur monté sur celui-ci, l'élément récepteur définissant le passage vertical et l'ouverture.

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6. Outil motorisé selon la revendication 1, comprenant en outre :

un élément à échelle de profondeur configuré pour être monté de façon coulissante sur le corps principal (100), l'échelle de profondeur ayant des premiers marquages correspondant à la première échelle de mesure et seconds marquages correspondant à la seconde échelle de mesure.

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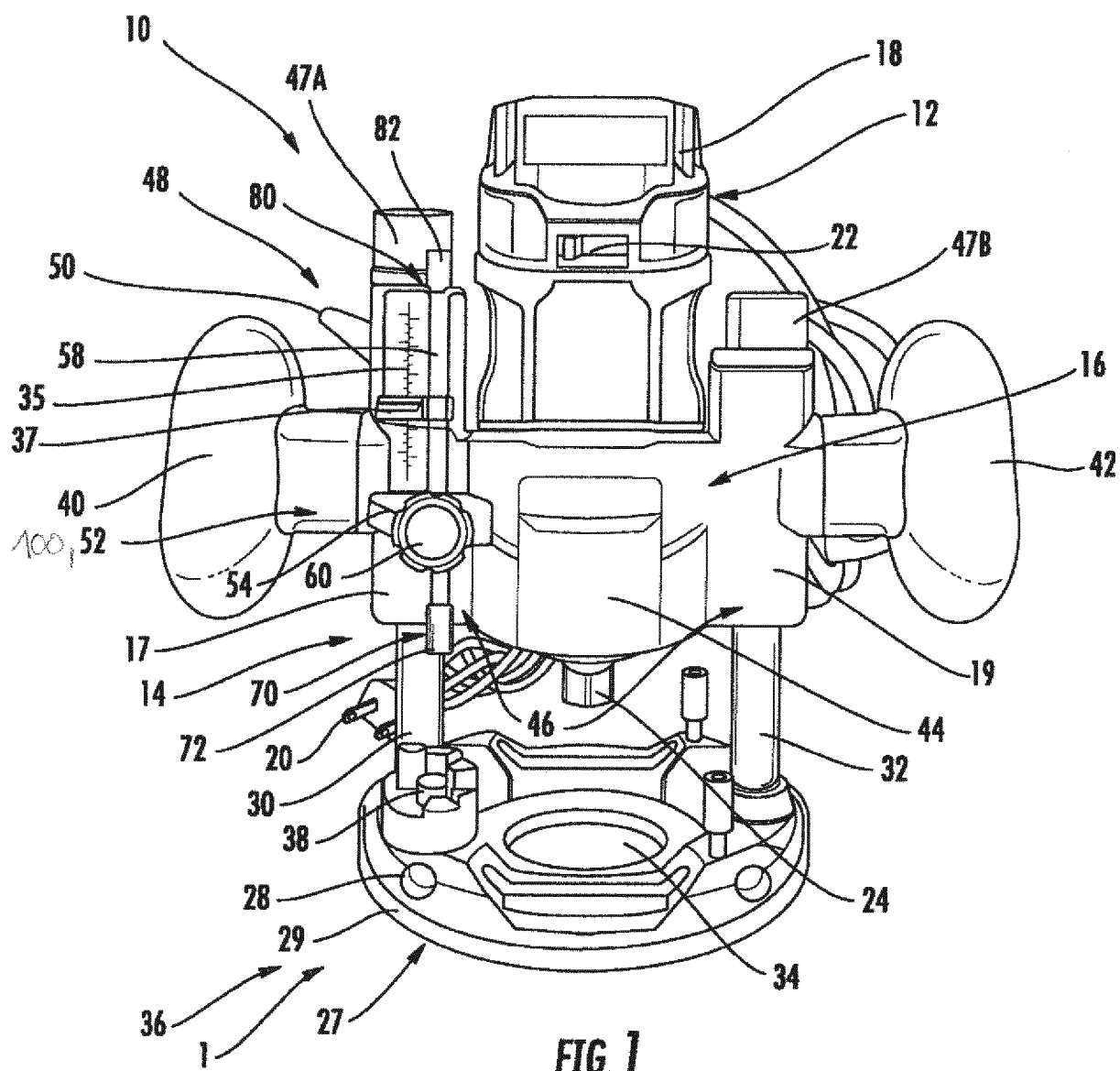
7. Outil motorisé selon la revendication 1, dans lequel l'outil motorisé portatif est une défonceuse (12).

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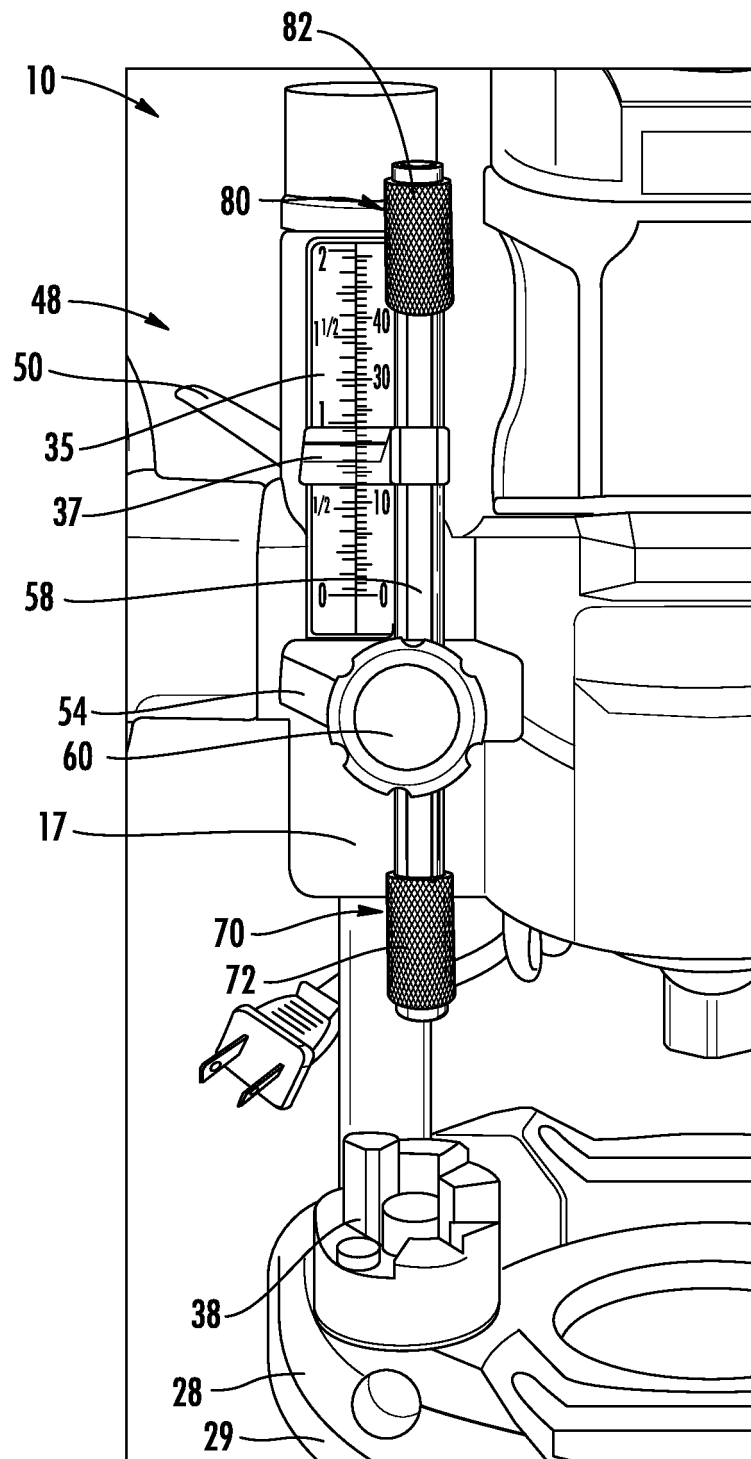


FIG. 2

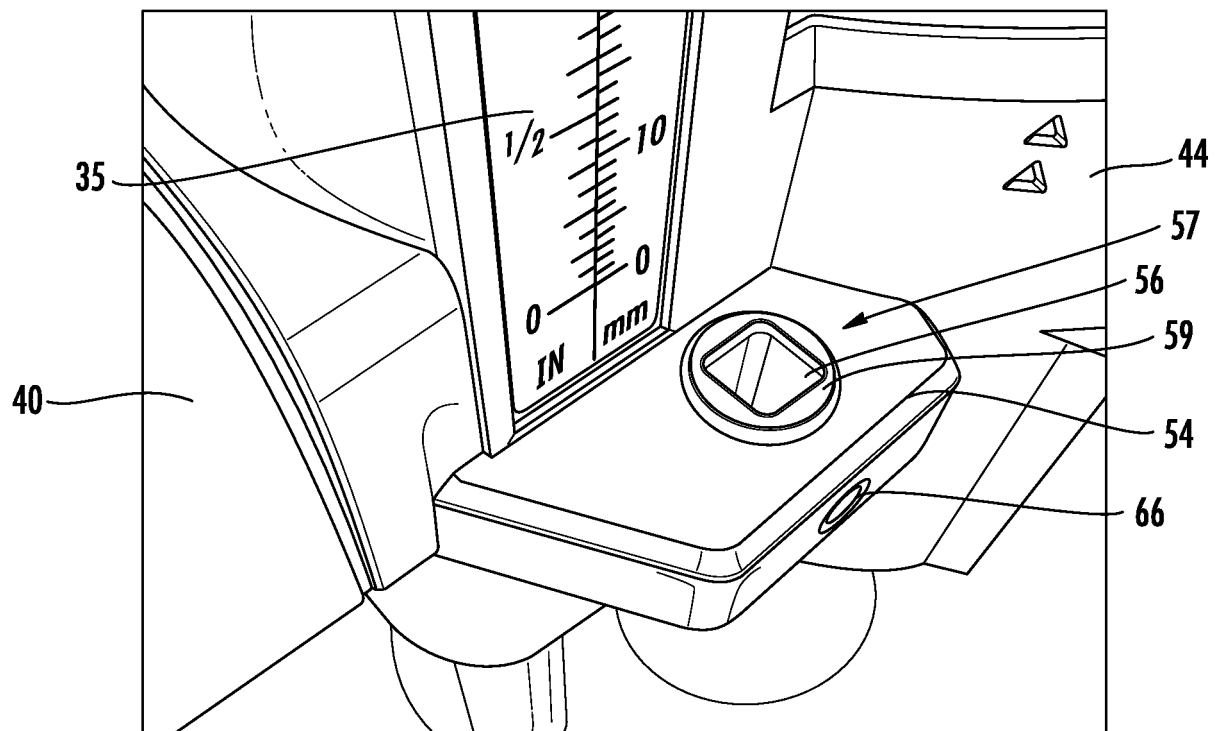


FIG. 3A

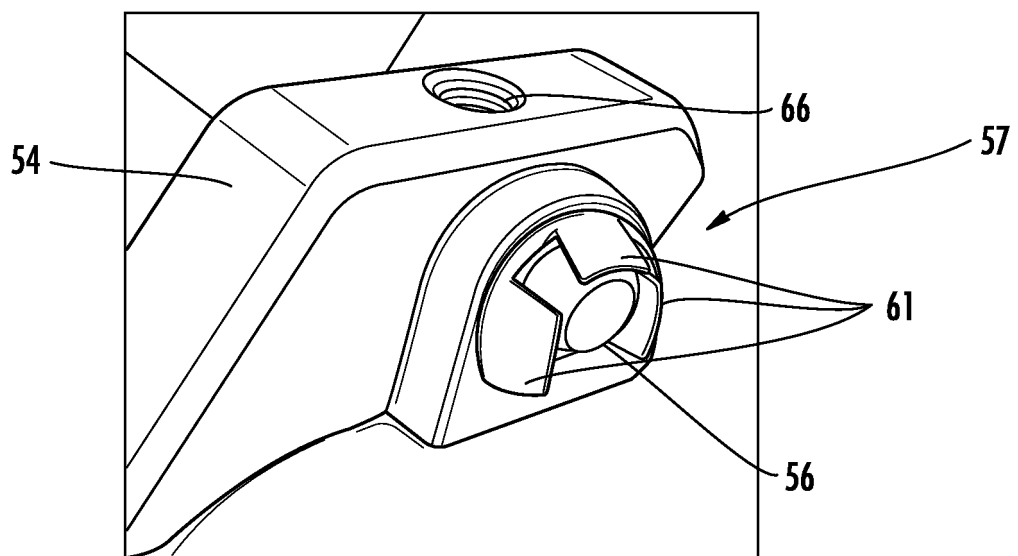


FIG. 3B

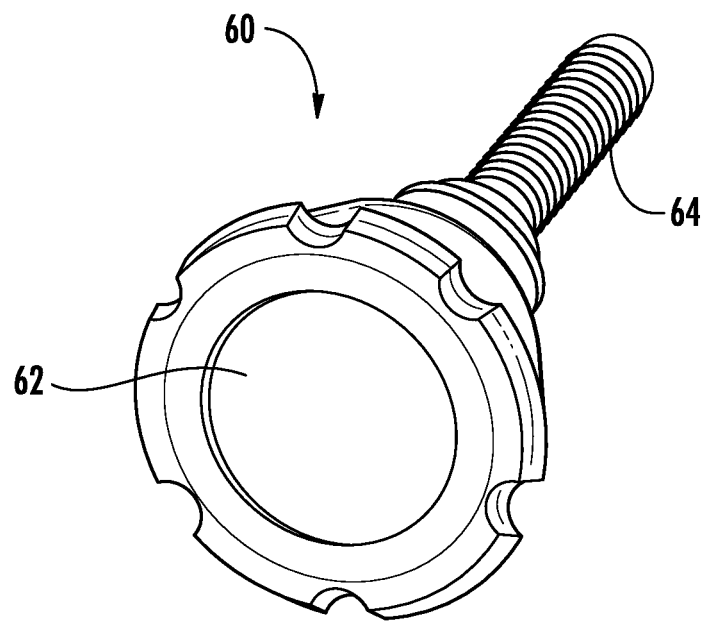


FIG. 4

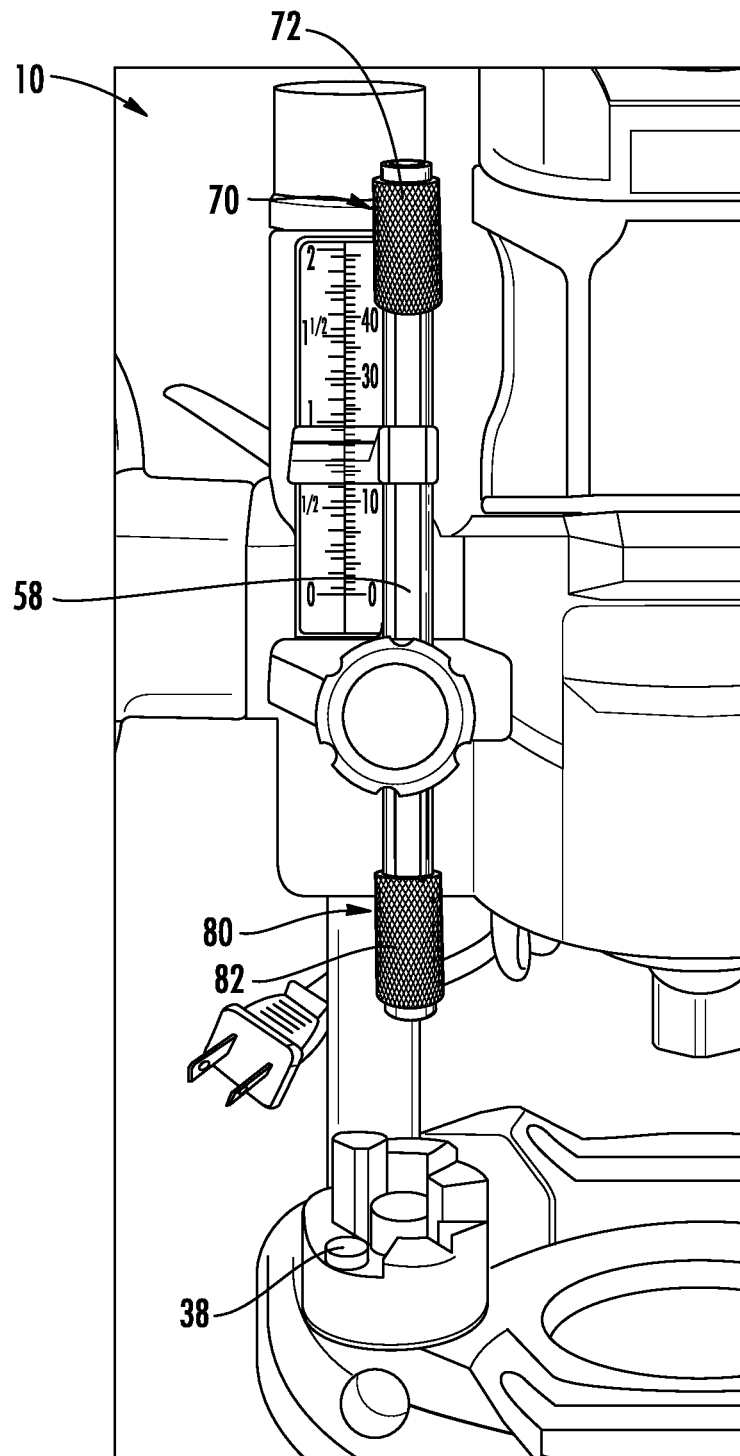


FIG. 5

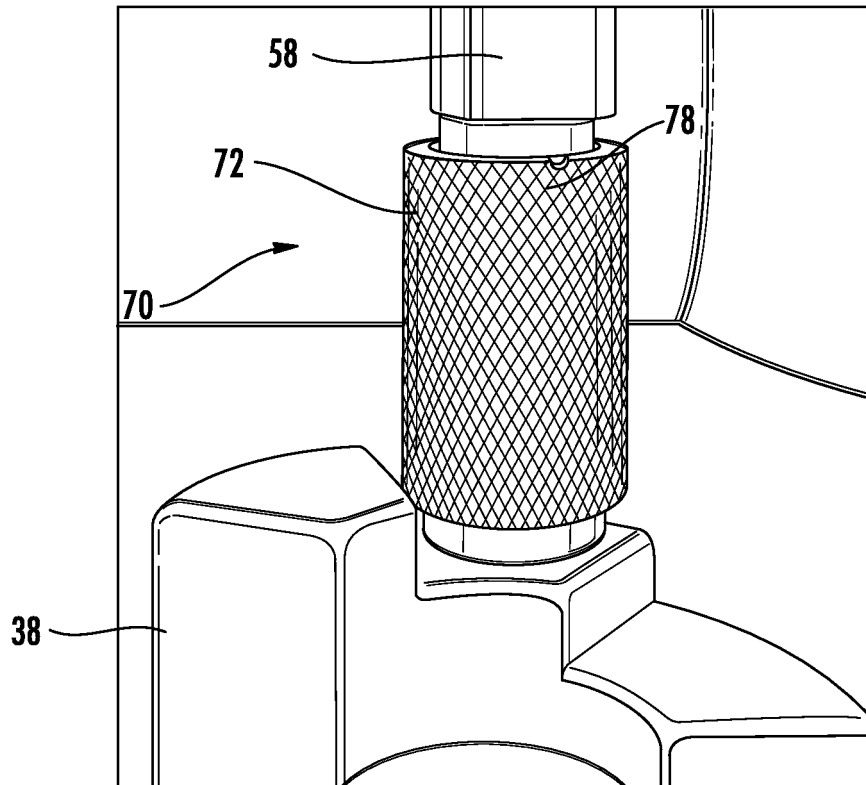


FIG. 6

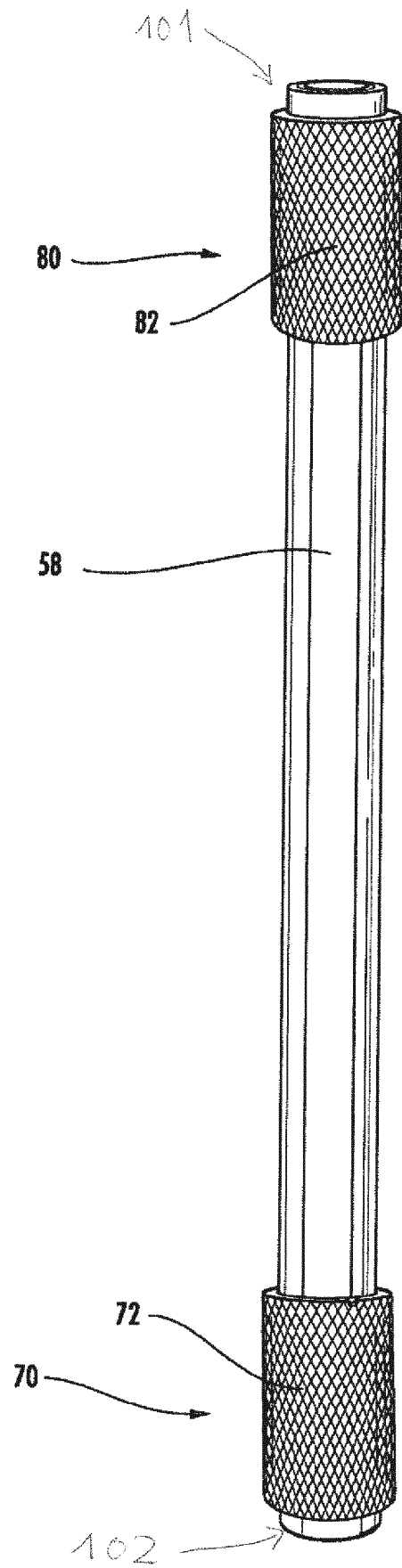


FIG. 7

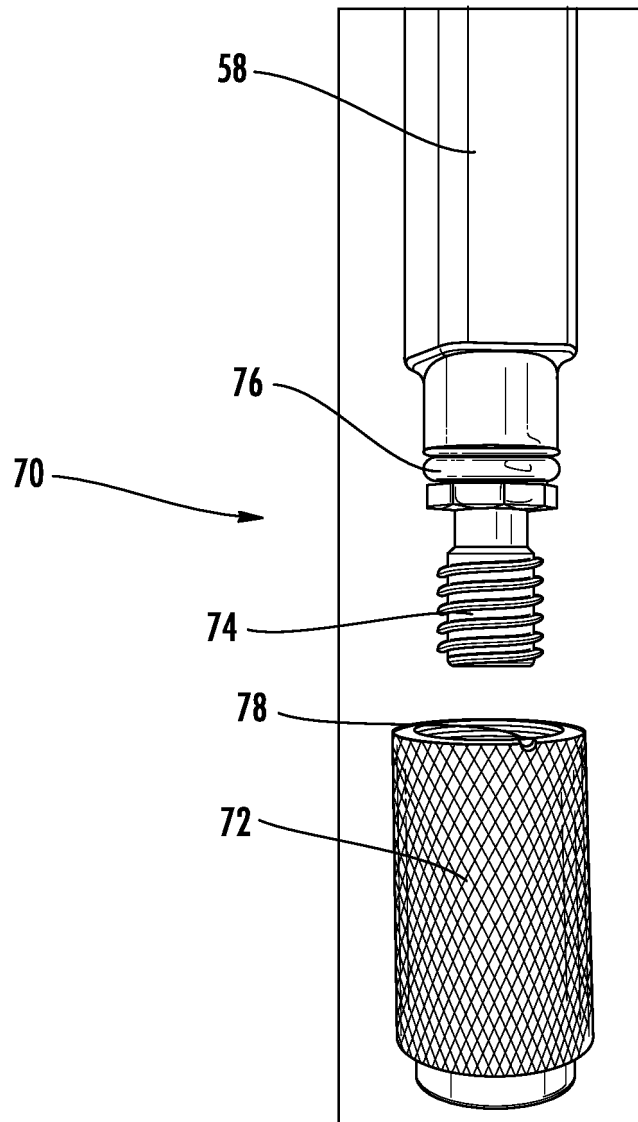


FIG. 8A

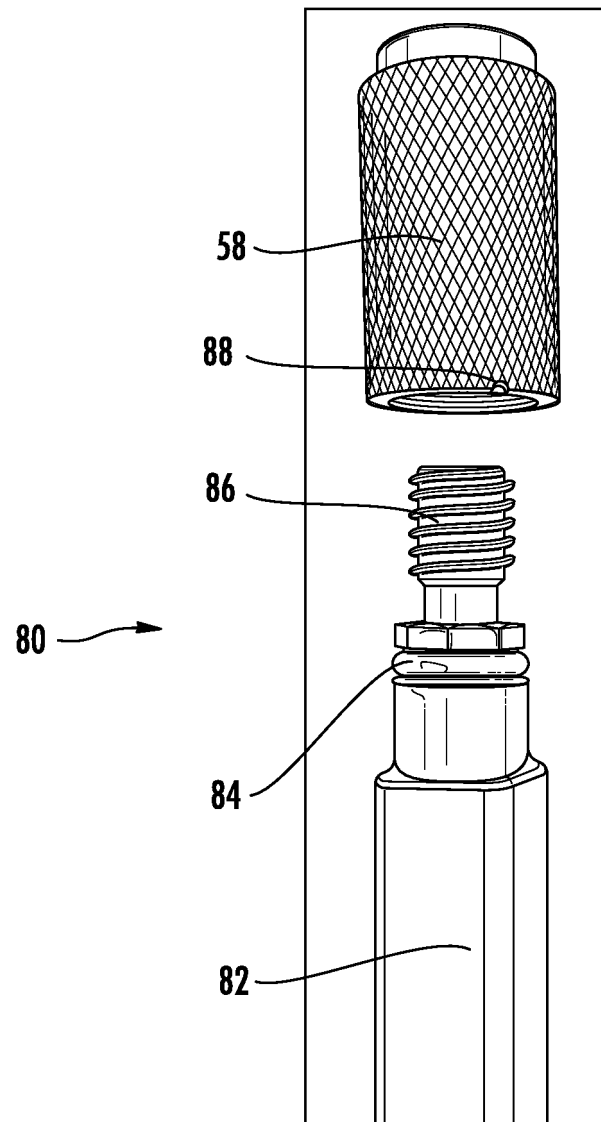


FIG. 8B

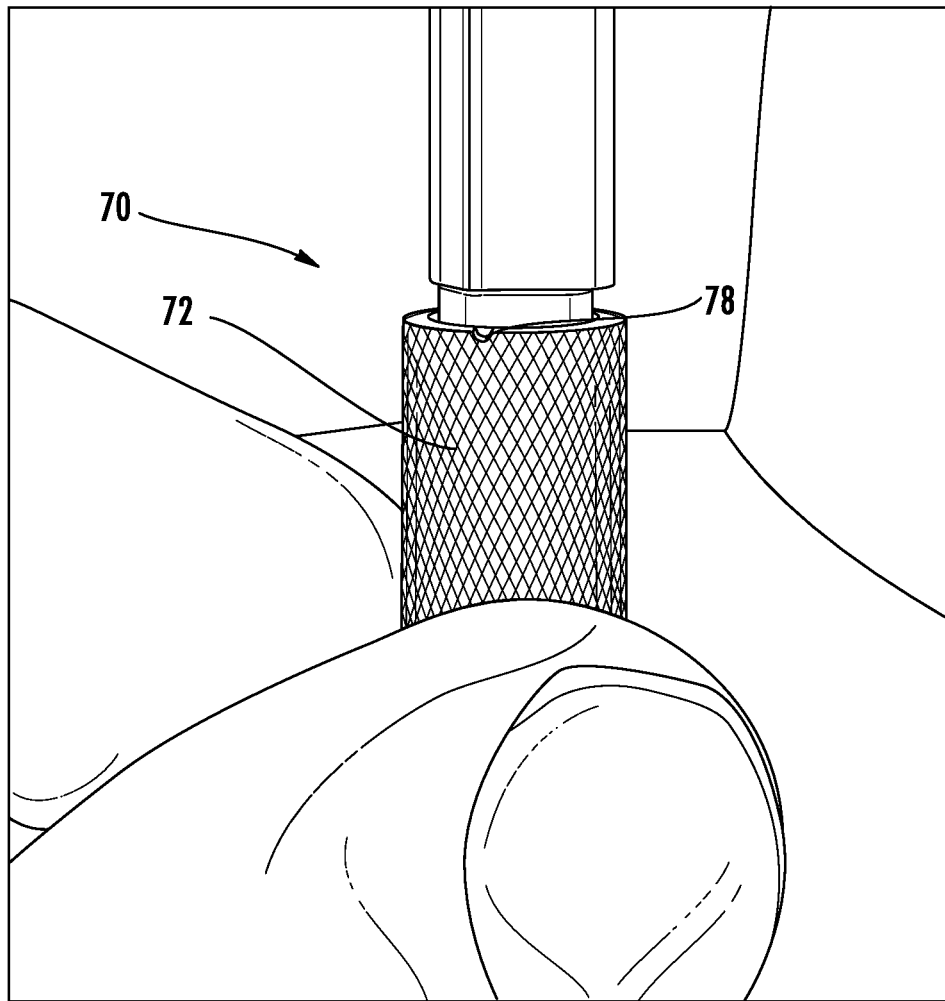


FIG. 9

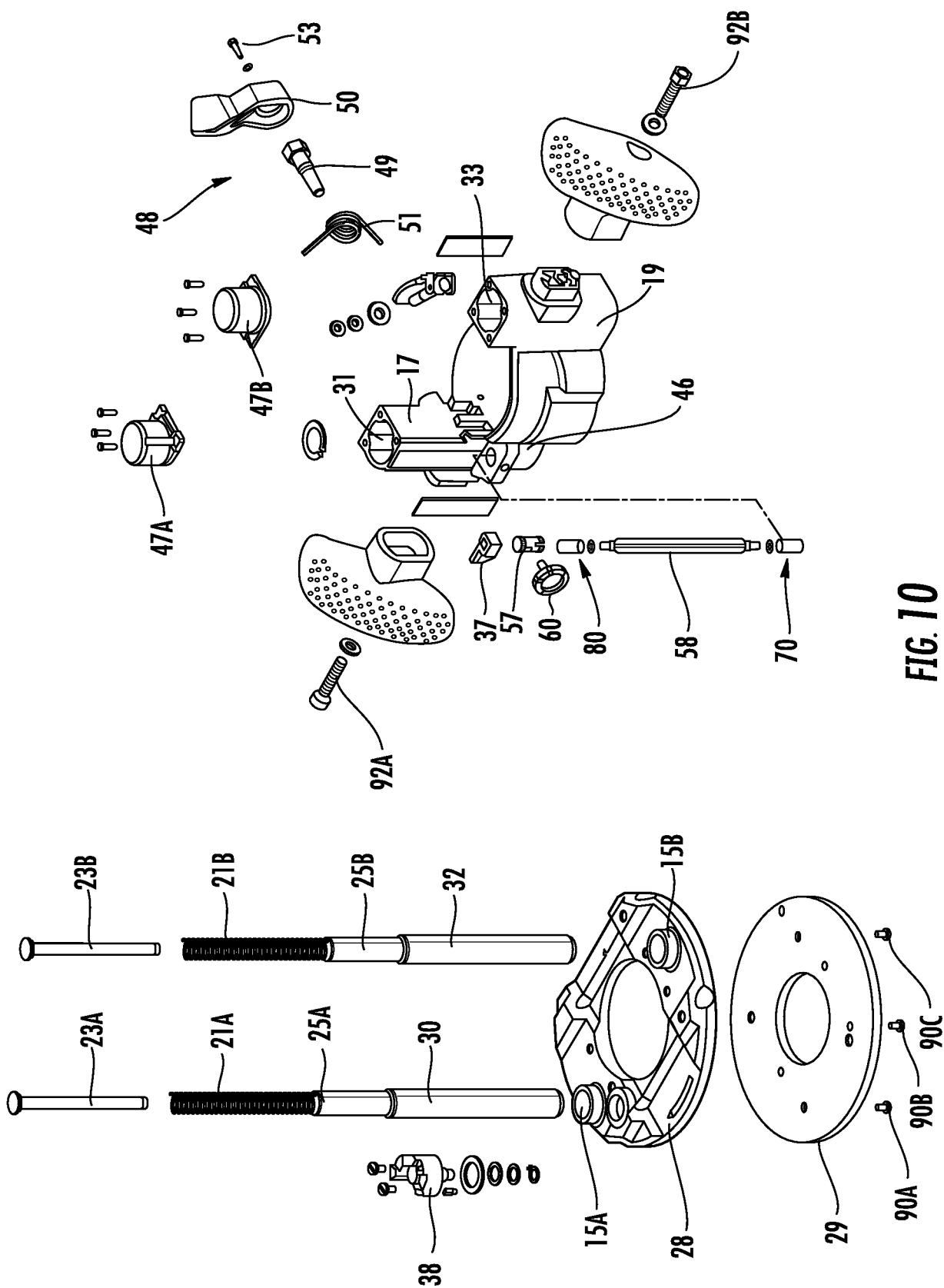


FIG. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 03000473 A1 [0001] [0009]
- US 3418965 A [0008]